

Date: 3/11/2015

From: Tariq Khraishi, PhD

Subject: Expert report on the injury case of Nedra Denison

This is an expert witness report submitted by Professor Tariq Khraishi on the injury case of Nedra Denison. On February 12, 2011, in Apache Junction Arizona at the Superstition Butte Mobile Home Park, Nedra Denison was attempting to exit the 2009 Seneca (VIN# 1GBG541957F424211), originally purchased February 1, 2010 when the RV steps (step #902509000 ser. 0707273/62) collapsed causing her to fall. She suffered injuries including; acute distal radius fracture (broken right arm) and ankle injury (strain, sprain).

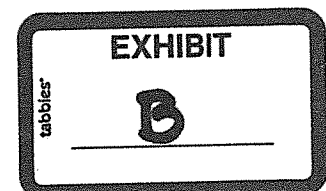
Tariq Khraishi is an expert in materials science/engineering. He is also an expert in mechanical design, mechanics of materials, and manufacturing/fabrication techniques. His expertise stems from research and teaching activities in the above.

TK has examined the broken steel steps. The fracture occurred in the area next to a welding spot. This is a heat-affected zone. This indicates either a defective; craftsmanship/fabrication and/or materials. For example it could indicate an embrittled material with marteniste formation in the steel (Note: martensite is a very brittle phase of steel). Also, it could indicate improper heat treatment of the weld area after welding to avoid brittle spots (i.e. easily-fracturable spots).

Take a look at the broken steps shown in Figure 1. On the left-side of the picture, there is a top link that broke and caused Nedra's losing balance. The link that broke is highlighted in a blue circle (Figure 2). This link links the top step with another long arm in this mechanism. If you are looking at steps from outside while standing in front of them, the broken link would be on the left. Figure 3, which is a zoomed in image, shows the extent of the fracture into the width and thickness of the link. The loss of stiffness in the structure due to this large crack caused Nedra to lose her balance and fall.

Upon further examination of the right-side of the steps that did not have this large crack, it appears that the welding process utilizing a torch caused an ingress or groove (i.e. a smaller crack) in the link. This can be clearly seen in Figure 4. Such a small crack/ingress due to this faulty welding process also existed on the left-side of the steps and ended up enlarging to the extent that structural stiffness was lost and Nedra fell down (as seen in Figure 3 which shows different surface colors for the ingress/small crack which is rusted/oxidized from being exposed to air for a long time versus the more shinier surface, i.e. less rusted/oxidized, representing the large crack that grew due to this initial ingress and which is not as old as the initial ingress). These links are highly loaded parts of the mechanism, as evidenced by the strong peeling of paints in these exact spots, and this fact combined with the initial cracks/ingresses caused a bigger crack that caused the accident in my technical and experiential judgement.

This fracture caused the steps to loose their horizontal leveling (even by a few degrees) and therefore were directly responsible for unexpecting Nedra losing her balance and falling (and thus getting badly injured), i.e. destabilizing this structure/steps.



This is not something we would expect to see at this stage in the life of the product. No inflected damage was observed to indicate improper use of the product. This again points to the defective craftsmanship/fabrication that caused the fracture. Attached below (last page) is a product detail and photographs of the fracture in the steps.

In summary it is my technical opinion and I am confident in it, based on established material science and engineering principles* and my careful examination of the evidence steps, that the steps were defective in craftsmanship/fabrication and/or materials used in the manufacturing process.

* Fracture and crack mechanics, phase formation in steels and relationship to heat treatment and cooling rates. See the textbook by William D. Callister, Jr. and David G. Rethwisch, "Materials Science and Engineering: An Introduction", John Wiley & Sons, Inc. 2010. Also, "Fracture Mechanics: Fundamentals and Applications" by T.L. Anderson, CRC Taylor & Francis Group, 2005.

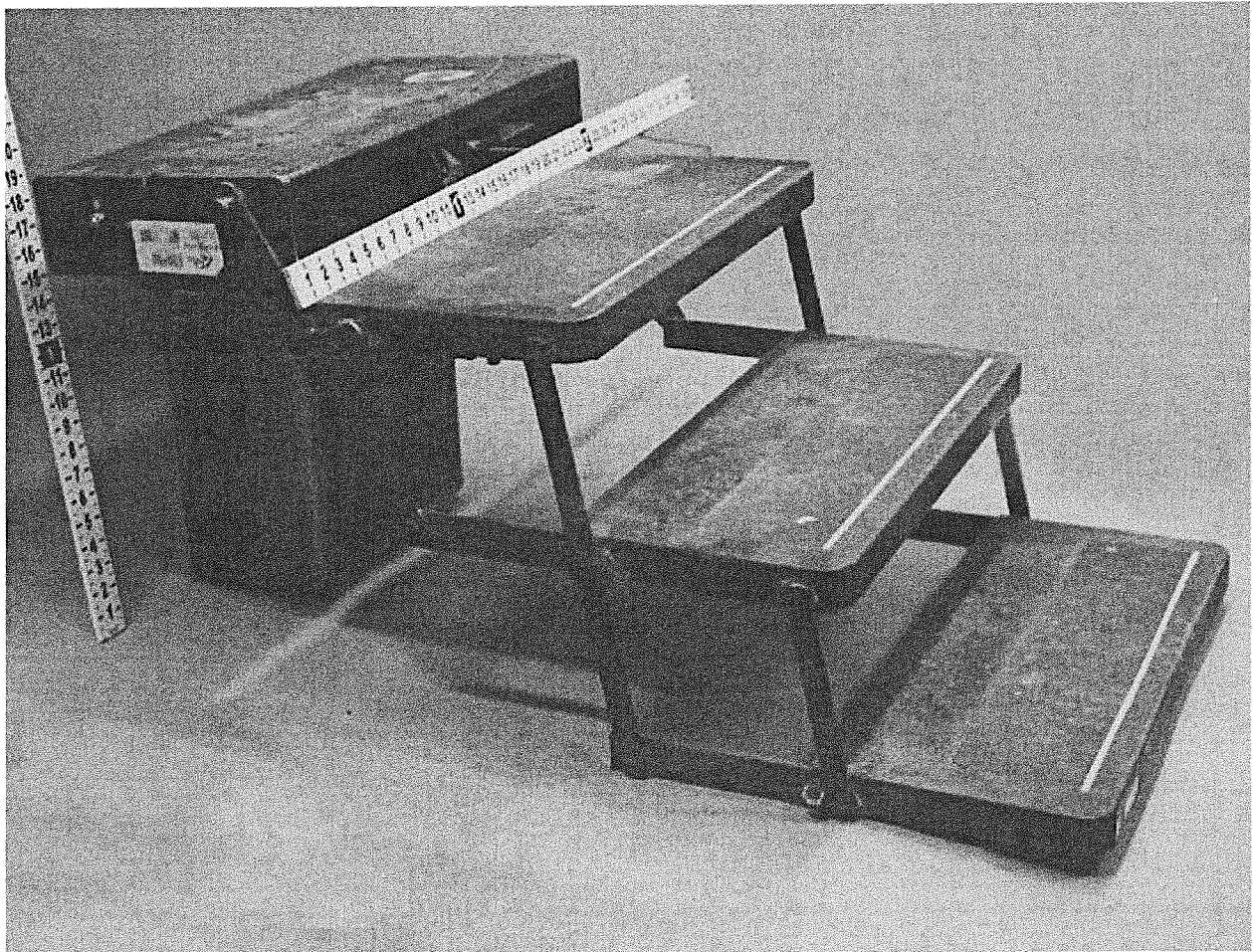


Figure 1. Picture of the broken steps

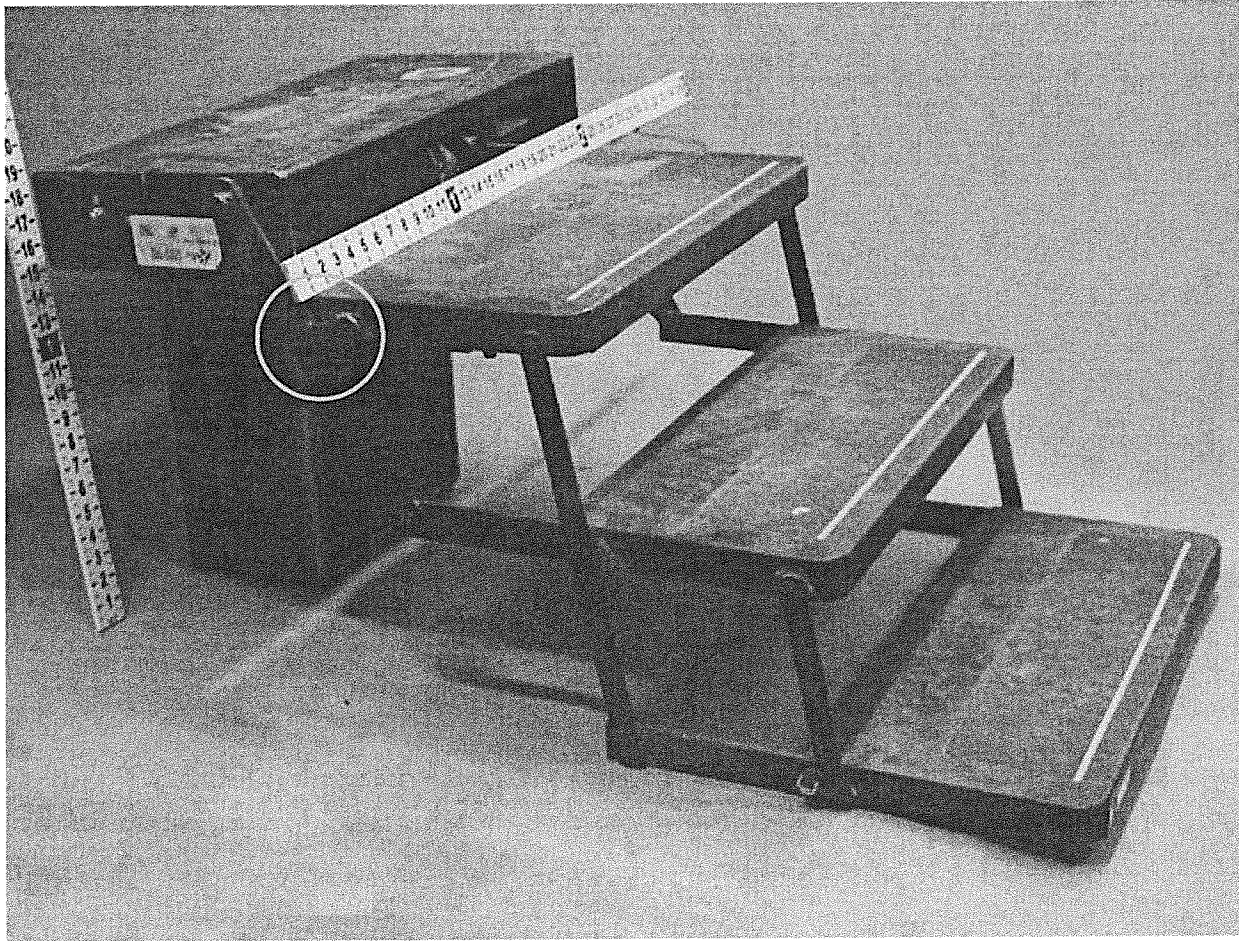


Figure 2. Picture of the steps with broken link in a blue circle